Review

5.5.3-5.5.4 Function of Several Random Variables

If U is a function of independent random variables,

EU =

VarU =

Sampling Distribution – distribution of values a sample statistic takes in repeated sampling.

Sample Means

Sampling Distribution of X-bar:
- has the same mean as original population
- has smaller standard deviation than original population
- (CLT) for any shape population, shape of distribution of X-bar goes towards Normal as n increases
- \( \bar{X} \sim N \left( \mu, \frac{\sigma}{\sqrt{n}} \right) \)

When can you use the Normal Table to find probabilities? Which z-score do you use?

<table>
<thead>
<tr>
<th></th>
<th>X is Normal</th>
<th>X is not Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>One individual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample mean when n&lt;30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample mean when n&gt;30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.1-6.4 and 6.6 Introduction to Formal Statistical Inference

- **Statistical Inference (CI and Sig Tests)** – use random and representative sample to draw conclusions about population AND attach measure of reliability to it.

Confidence Intervals

Find Formulas for CI by using the table:

Interpretation –
- CI is a statement about a PARAMETER, not about statistic or individuals.
- “Probability” applies BEFORE we take data. After we use the word “confidence”.
- Interpret Results (CI include zero or #H₀)

Behavior –
- as confidence level increases – CI bigger
- as n increases – CI smaller

Finding n for one sample mean–
- margin of error = \( z^* \frac{\sigma}{\sqrt{n}} \)
- solve for n (always round up)

Finding n for one sample proportion
- \( n = \frac{z^2p^*(1-p^*)}{\Delta^2} \)
- p* equals 0.5 if you have no idea what the true proportion is
- p* can also be last years p-hat or if you are knowledgeable about the subject your guess
Significance Tests for $\mu$:

Ho                     Ha

$TS =$

$p\text{-value} = \text{"corner" area}$

Conclusions – small $p\text{-value}$ supports Ha
Assumptions the t for one sample mean, paired means and two independent means

Why do we use the t table?

- What do we need (Assumptions)?
  1. Random Samples
  2. Population is Normal

- How do we check?
  1. Read story and THINK.
  2. Plot Data as long as there are NO OUTLIERS proceed.

Assumptions for the CI and Sig. Tests for \( p \) and \( p_1 - p_2 \) using the \( z \)

- Why do we use the \( z \) table?

- What do we need (Assumptions)?
  1. Random Samples-to extend conclusions
     *Data is independent and comes from a stable system.
  2. Check specific assumption for that test
     *Have to have at least 5 successes and 5 failures.

How do we check these?

  1. Think about the story.
  2. Look at the data.
Additional Items

- READ MINITAB OUTPUT.

- What is the correct sampling distribution for the two independent means case?